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PATENT SPECIFICATION

DRAWINGS ATTACHED

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902,093

THE PATENT OFFICE LONDON

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International Classification:—F06d.

COMPLETE SPECIFICATION

Improvements in Brakes, Clutches and the like

We, DUNLOP RUBBER COMPANY LIMITED, a British Company of 1, Albany Street, London, N.W.1, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to brakes, clutches and the like and more particularly relates to means for securing and supporting metal-bonded friction materials in disc brakes.

Friction materials currently in use in heavy-duty disc brakes comprise a non-metallic, usually ceramic, friction material bonded with a suitable metallic powder. The unsintered material is usually placed in contact with a backing plate and the whole subjected to pressure whilst being sintered in a furnace in a suitable atmosphere. Alternatively the sintered composition may be located in a cup-shaped holder which is secured to a backing plate by rivet or like means.

It has been found that those materials which give the most desirable friction properties are weak at high temperatures and tend to squash or are friable and break up at the leading and trailing edges, thus needing a cup-like support, whilst those materials which are inherently strong enough to support the loads placed upon them do not normally exhibit desirable friction properties. The use of a cup suffers from a serious disadvantage in that the base of the cup, which is usually about .040 thick, does no real work in providing friction or wear resistance, and this thickness of cup must be added to the overall thickness of the brake, making a thicker brake necessary for a given energy absorption.

The object of this invention is to provide a brake, clutch or like mechanism wherein this disadvantage is overcome.

According to the present invention a brake, clutch or the like comprises an annular backing plate having a plurality of individual pads of friction material secured to at least one radially extending surface thereof, and a continuous metal outline holder around the periphery of each pad of friction material, said metal outline holder standing proud of said surface and being formed integral with the annular backing plate or secured thereto by sintering, welding, brazing or the like.

The invention is of particular value for heavy-duty multi-disc aircraft brakes and preferably the friction pad consists of a metal-bonded inorganic friction material. The friction material may be pressed in powder form into the outline holder which may already be secured to the backing member, which, in the case of a disc brake, would preferably be an annular plate, and the whole plate heated in a suitable atmosphere to sinter the friction material. Alternatively the friction material may be pressed from powder, sintered and then pressed into the prepared holder.

The holder itself may be made from metal powder, pressed and then sintered to the backing plate or it may be pressed and sintered and then brazed or welded to the backing plate. The holder should be strong enough to withstand any loads imposed on it in service. Alternatively the holder may be machined from a tube or an extrusion of the required section or it may comprise a flat strip bent to the correct shape, the ends being secured together. It may comprise a pressing, casting or the like secured to the backing plate by any convenient means such as brazing, welding or the like. Alternatively it may be cast or formed integral with the backing plate.

The holder may be circular, rectangular, segmental or any other convenient shape. The sides of the holder can be normal to the surface of the backing plate or inclined thereto at a suitable angle. For example, the holder can originally be made normal to the surface of the backing plate and then inclined inwardly towards the friction material after said material is fitted, to hold it securely in place.

The friction pads may, however, consist of fibrous material bonded with synthetic resin.

A disc brake constructed in accordance with the invention will now be described in more detail, by way of example, with reference to the accompanying drawings, in which:—

Figure 1 is a diagrammatic sectional view through part of the brake,

Figure 2 is a front view showing part of one of the friction members of the brake, and

Figure 3 is a corresponding edge-on view.

The brake shown in Figure 1 includes a pair of spaced axially slidable brake discs 10 which are mounted to rotate with an aircraft wheel (not shown). The wheel has a stationary hub 11 carrying a series of radially extending tenons 12, which engage radial slots in the backing plates 14 of three braking members, so that the braking members can move axially on the hub but cannot rotate. As will be seen, one braking member 15 is located between the brake discs 10, another braking member 16 is situated between one of the brake discs and a fixed reaction member 17 and the third braking member 18 is disposed between the other brake disc and a torque member 21.

The backing plates 14 of the outer braking members 16, 18 carry on their inner sides a number of spaced friction pads 19 each entirely filling a circular metal holder 20 fixed to the backing plate. The centre braking member 15 has similar friction pads on both sides of its backing plate 14 as shown in Figures 2 and 3.

The torque member 21 is provided with a plurality of angularly-equispaced piston and cylinder mechanisms, one of the pistons being shown at 22 in Figure 1. The pistons 22 are connected by links 23 to an annular pressure plate 24 and serve to force it to the right as seen in Figure 1, when fluid pressure is admitted to the cylinders, to apply the brake.

The holders 20 wear down at the same rate as the friction pads 19 but are at the same time strong enough to prevent deformation of the friction pads during operation of the brake.

The invention is applicable to drum brakes and to brakes or clutches of all kind comprising either resin bonded or completely inorganic friction materials.

WHAT WE CLAIM IS:—

1. A brake, clutch or the like comprising an annular backing plate having a plurality of individual pads of friction material secured to at least one radially extending surface thereof, and a continuous metal outline holder around the periphery of each pad of friction material, said metal outline holder standing proud of said surface and being formed integral with the annular backing plate or secured thereto by sintering, welding, brazing or the like.

2. A brake, clutch or the like according to claim 1 wherein the friction pads consist of a metal-bonded inorganic friction material.

3. A brake, clutch or the like according to claim 2 wherein the friction pads have been prepared by sintering in situ in the metal outline holder.

4. A brake, clutch or the like according to claim 3, wherein the friction pads are circular.

5. A brake, clutch or the like according to any of the preceding claims wherein the friction pads are equally spaced around one or both surfaces of said annular backing plate.

6. A disc brake substantially as described herein with reference to the accompanying drawings.

C. H. BOWYER,
Agent for the Applicants.

PROVISIONAL SPECIFICATION

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We, DUNLOP RUBBER COMPANY LIMITED, a British Company of 1, Albany Street, London, N.W.1, do hereby declare this invention to be described in the following statement:—

This invention relates to brakes clutches and the like and more particularly relates to means for securing and supporting metal-bonded friction materials in disc brakes.

Friction materials currently in use in heavy-duty disc brakes comprise a non-metallic, usually ceramic, friction material bonded with a suitable metallic powder. The unsintered material is usually placed in contact with a backing plate and the whole subjected to pressure whilst being sintered in a furnace in a suitable atmosphere. Alternatively the sintered composition may be located in a cup-shaped holder which is secured to a backing plate by rivet or like means.

It has been found that those materials which are weak at high temperatures and tend to squash or are friable and break up at the leading and trailing edges, thus needing a cup-like support, whilst those materials which are inherently strong enough to support the loads placed upon them do not normally exhibit desirable friction properties. The use of a cup suffers from a serious disadvantage in that the base of the cup, which is usually about .040" thick, does no real work in providing friction or wear resistance, and this thickness of cup must be added to the overall thickness of the brake, making a thicker brake necessary for a given energy absorption.

The object of this invention is to provide a brake, clutch or like mechanism wherein the disadvantage is overcome.

According to the present invention a brake, clutch or like mechanism comprises a friction pad backing member and a pad of friction material located on said member and having a continuous metal support extending only around the periphery thereof and secured at one end to said member.

The invention is of particular value for heavy-duty multi-disc aircraft brakes and preferably the friction pad comprises a metal-bonded inorganic friction material. The friction material may be pressed in powder form into the outline holder which may already be secured to the backing member, which, in the case of a disc brake, would be an annular plate, and the whole plate heated in a suitable atmosphere to sinter the friction material. Alternatively the friction material may be pressed from powder, sintered and then pressed into the prepared holder.

The holder itself may be made from metal powder, pressed and then sintered to the backing plate or it may be pressed and sintered and then brazed or welded to the backing plate. The holder should be strong enough to withstand any loads imposed on it in service. Alternatively the holder may be machined from a tube or an extrusion of the required section or it may comprise a flat strip bent to the correct shape, the ends being secured together. It may comprise a pressing, casting or the like secured to the backing plate by any convenient means such as brazing, welding or the like. Alternatively it may be cast or formed integral with the backing plate.

The holder will normally follow the shape of the friction pad and hence may be circular, rectangular, segmental or any other convenient shape. The sides of the holder can be normal to the surface of the backing plate or inclined thereto at a suitable angle. For example, the holder can originally be made normal to the surface of the backing plate and then inclined inwardly towards the friction material after said material is fitted to hold it securely in place.

One embodiment of a disc brake constructed in accordance with the present invention comprises a pair of axially-spaced axially-slidable annular discs rotatable with an aircraft wheel, an axially-slidable non-rotatable backing plate between said discs, an annular non-rotatable re-action member on the side of the discs inboard of the wheel and an annular non-rotatable torque member on the side of the disc outboard of the wheel. The torque member is provided with a plurality of angularly-equispaced piston and cylinder mechanisms the pistons of which abut an annular pressure plate and are adapted to force it inwardly of the wheel and towards the adjacent one of the two discs. The pressure plate and the reaction member are both provided on one side, and the backing plate on both sides, with a plurality of angularly-equispaced friction pad holders which are of circular shape and are secured at one end to their associated plate or member. A metal-bonded ceramic friction pad is located in each holder. On pressurizing the piston and cylinder mechanisms the rotatable discs and the non-rotatable members carrying the friction pads are forced together, hence braking the wheel. The holders wear down at the same rate as the friction material but are at the same time strong enough to prevent deformation of the friction pad during operation of the brake.

The invention is applicable to drum brakes and to brakes or clutches of all kind comprising resin bonded or completely inorganic friction materials.

C. H. BOWYER,
Agent for the Applicants.

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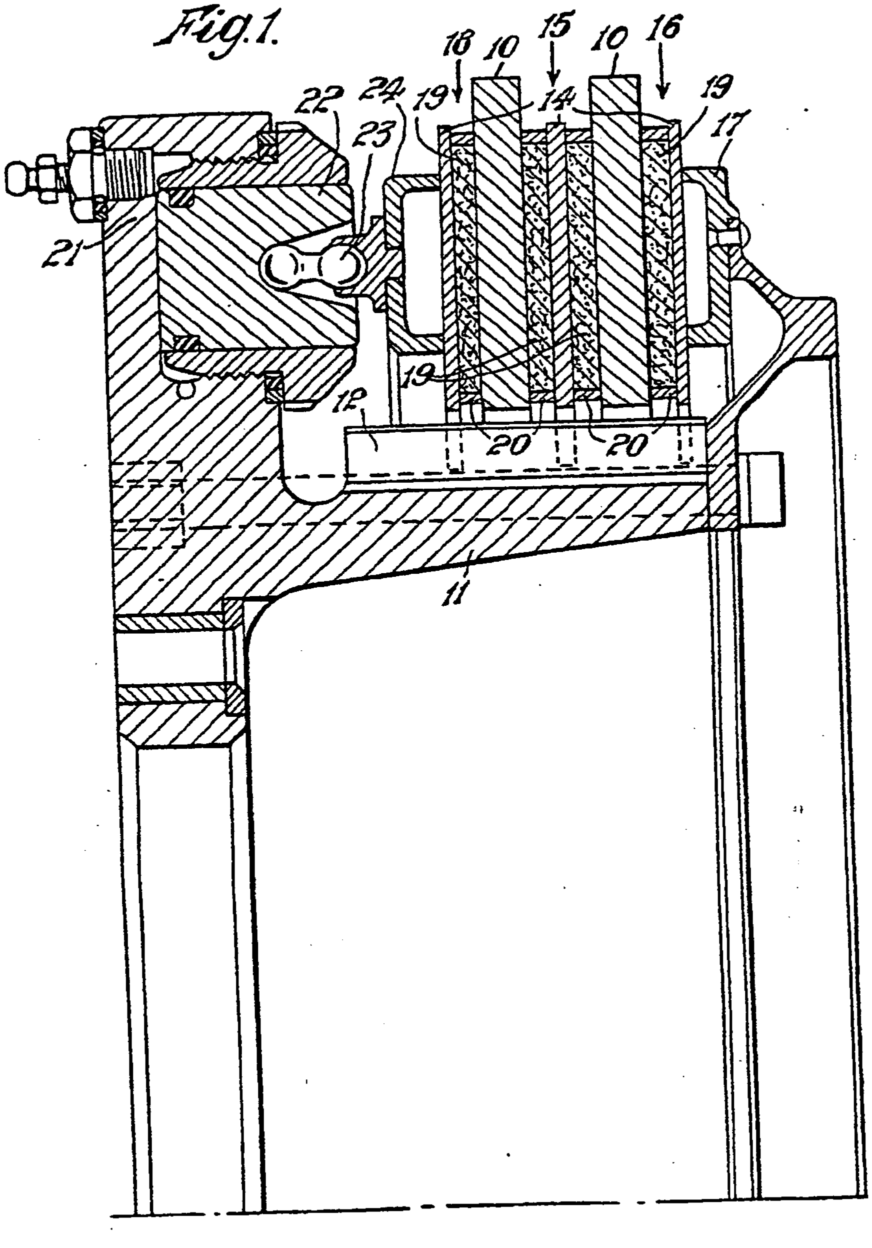
Fig.1.



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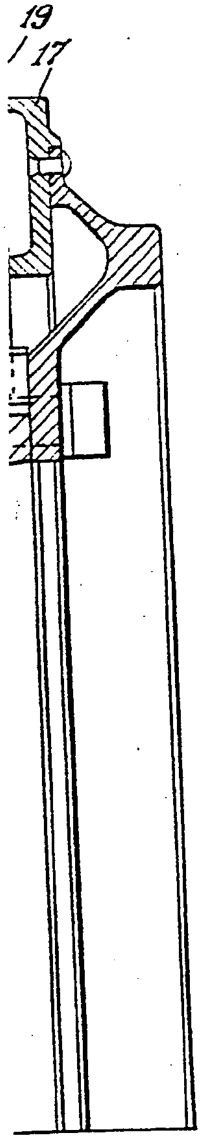
2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheets 1 & 2



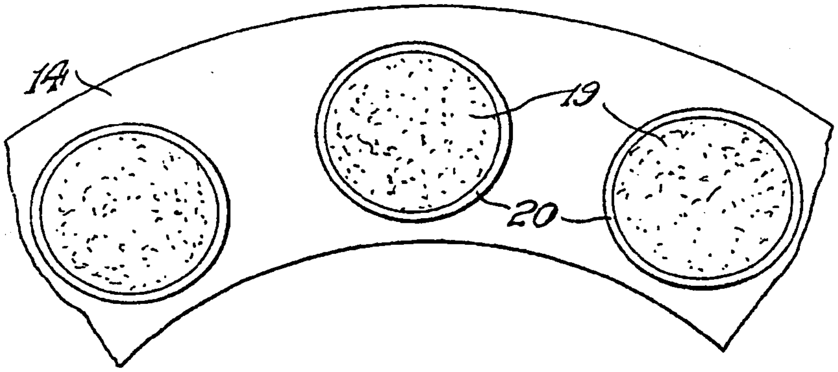


Fig. 2

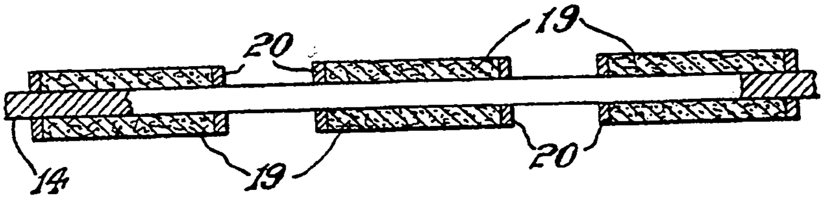


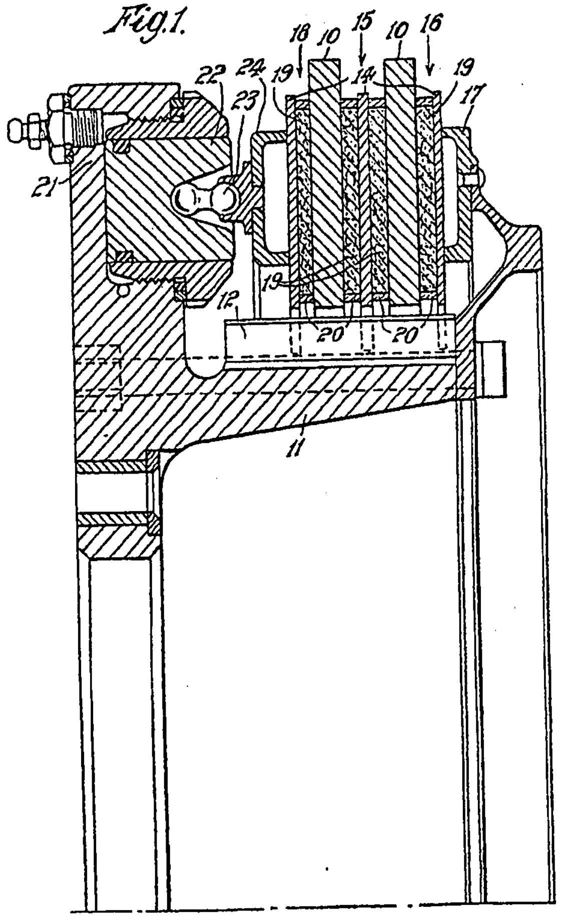
Fig. 3

902093 COMPLETE SPECIFICATION

2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheets 1 & 2

Fig.1.



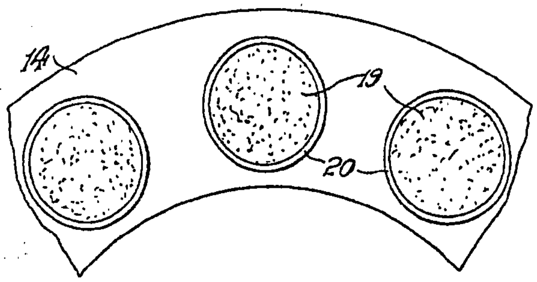


Fig.2

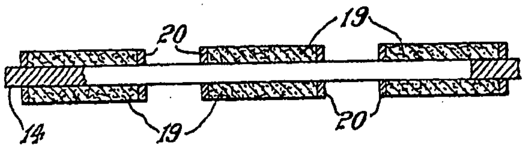


Fig.3